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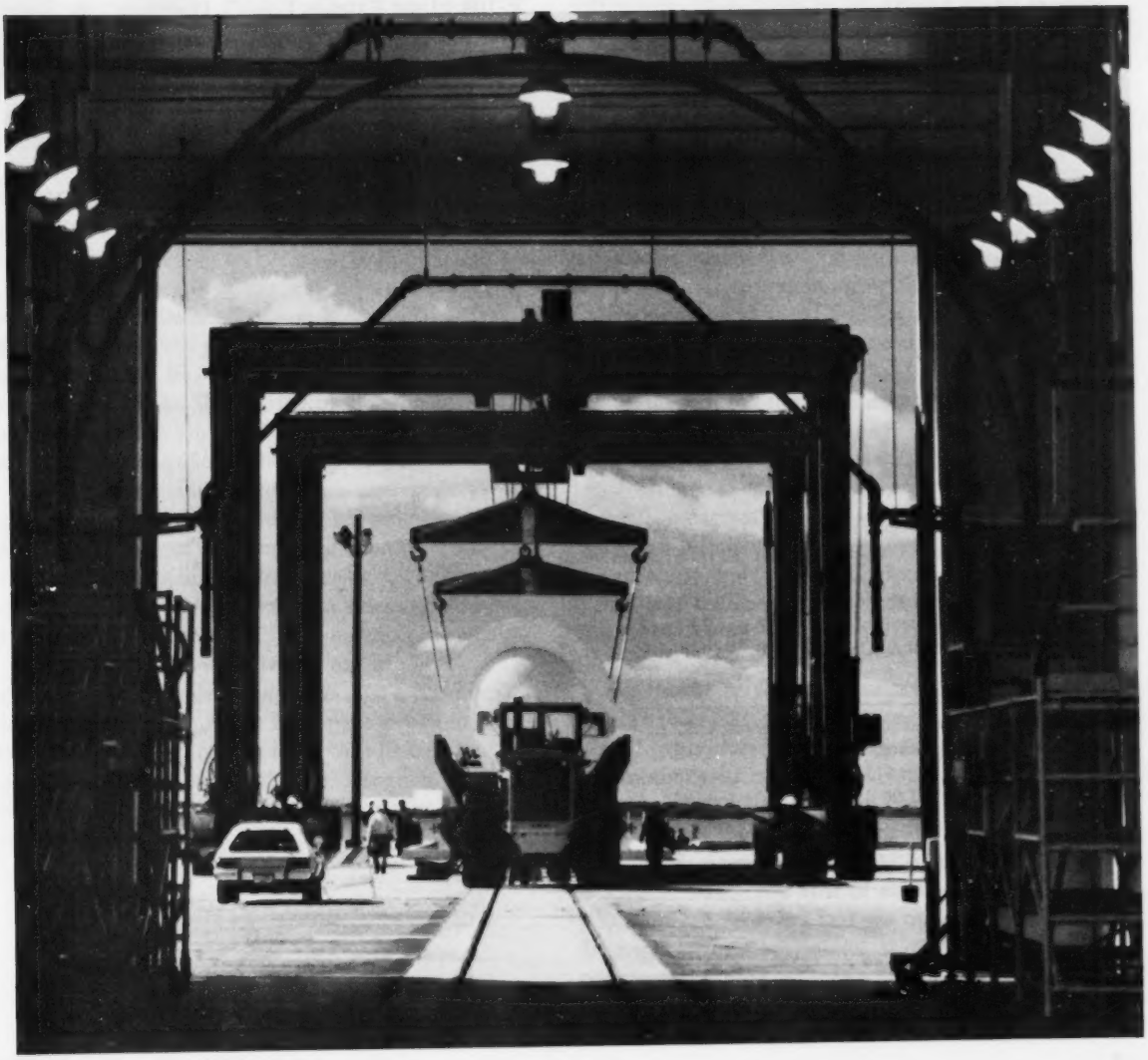

COVER

Water Wash Awaits—A full scale simulator of a Space Shuttle solid rocket booster motor, the huge white cylinder in the background, is towed into Hanger AF at the Kennedy Space Center. Inside is a high pressure water wash, designed to clean and refurbish spent booster motors after each Shuttle flight. The simulator, made by the Key Houston Co. of Jacksonville, Fla., has been used in practicing recovery of the boosters in Port Canaveral waters since March 3.

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Letter from Washington

Dear Colleagues:

As all of you know a proposed budget for FY 1981 was announced in January and Congressional hearings have been held on its various aspects since then. As stated at the time that budget was released, we found it a positive budget which moved us forward across a broad front.

On March 31st a new proposed budget was submitted reflecting NASA's participation in the President's program to control inflation by restraining Federal spending in Fy 1981. The amended budget reflects a reduction from the original of $219 million in budget authority and $224 million in outlays.

The specific details of funding reductions will have been available to all of you before publication of this letter so I will not list them here except to note that full funding has been retained for the development of the Shuttle, the production of follow-on orbiters and for NOSS and GRO, the two new starts specified in the original budget.

The essential point to be made is that while these reductions will force deferrals of several very important elements of our programs, with resultant loss of near-term benefits, and increased risks, we believe they constitute a careful, balanced curtailment of spending in support of the President's anti-inflation program.

Although painful, these reductions are not crippling. The amended budget permits a balanced, viable national aeronautics and space program, and the world-renowned NASA team with its tradition of excellence can and will make that program a reality. We will not reach all our goals as soon as we would like, but we will reach them all.

Sincerely,

A. M. Lovelace

A. M. Lovelace

Satellite System to Study Oceans

The NASA fiscal 1981 budget contains a major new start in space applications, calling for the development of a joint civil-military satellite system for ocean monitoring.

The program, called the National Oceanic Satellite System or NOSS, is planned to be a joint endeavor of NASA, the Department of Commerce's National Oceanic and Atmospheric Administration and the Department of Defense. The satellite system will be jointly funded and managed by the three agencies.

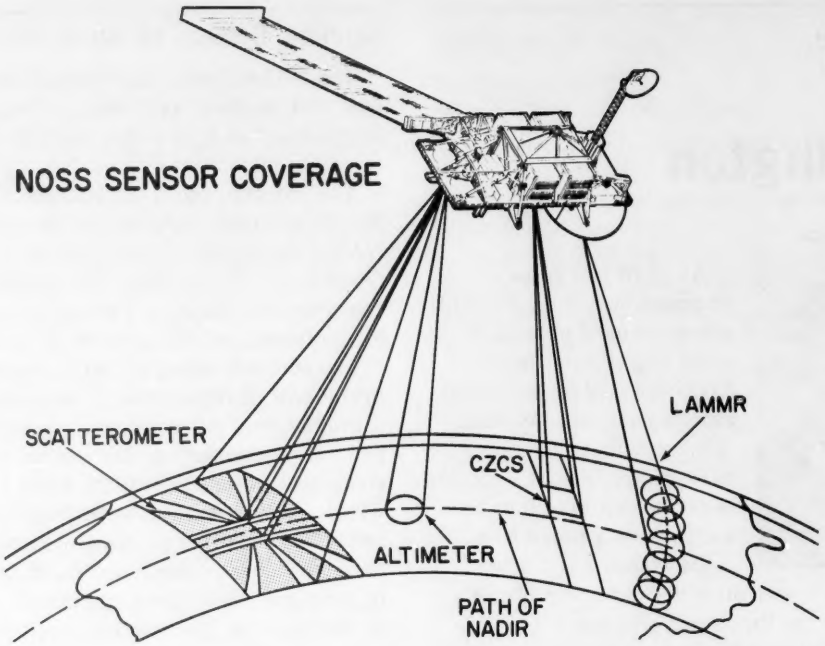
The new monitoring system is proposed as a limited operational demonstration of the feasibility of providing from polar-orbiting spacecraft—in near real time and under varying weather conditions—continuous observation of the Earth's ocean surface winds, sea state, surface water temperature, wave height, ice and other geophysical measurements. The basic instrument complement for the satellite consists of three previously flown instruments and one now in development. The new instrument is the large antenna multichannel microwave radiometer (LAMMR), with a 3.6-meter diameter antenna, a larger version of the Scanning Multichannel Microwave Radiometer flown on Nimbus 7. Primary usage of the radiometer is monitoring the sea surface temperature, wind speed and sea ice and providing atmospheric corrections for the on-board altimeter and scatterometer.

The altimeter is the same instrument flown on Seasat, except that two will be flown in the new system for redundancy to meet mission life requirements. It will monitor ocean wave parameters and ocean currents.

The scatterometer is an upgraded version of the Seasat scatterometer system. The new version will have six antennas instead of four and also redundant electronics. It will monitor surface wind velocity over the oceans.

The fourth instrument, the coastal zone color scanner (CZCS) is the same as one flown on Nimbus 7 with three additional channels and will monitor chlorophyll concentration and water turbidity distributions.

Data from the proposed satellite system, due to its coverage and timeliness, should improve the efficiency, safety and cost of ship operations, transportation, off-shore oil and gas exploration and drilling, platform operations, marine construction, commercial fishing, pollution monitoring, ice monitoring and marine search and rescue. Also, it is expected



to be especially useful in improving National Oceanic and Atmospheric Administration global weather forecasting services.

The U.S. Navy expects to use data from the monitoring system for the selection of operating areas, ship routing, strategic operations, anti-submarine warfare, acoustic predictions, tactical ship routing and global ocean data forecasting.

Astronauts Get New Simulator

First use of a new NASA flight simulation facility will be in support of the Space Shuttle. Called the vertical motion simulator, the trainer at NASA's Ames Research Center, is designed to improve flight characteristics of many different types of aircraft. But the Shuttle has first priority.

The series of Shuttle simulation investigations will help to evaluate changes planned for the orbiter control system. The primary objective of the Shuttle modifications is to improve the control characteristics of the spacecraft in the atmospheric reentry phase and during landing and rollout.

The vertical motion simulator has an improved motion range capability over other facilities. It can more accurately reproduce the motion an astronaut at the controls of the Shuttle orbiter would feel during approach, flare and landing.

Unplanned oscillations about the pitch and roll axes are not uncommon in high-performance aircraft and normally occur at times when the pilot's workload is high, i.e., during the landing phase. The tendency for the spacecraft to develop oscillations was substantiated during approach and landing tests conducted at NASA's Dryden Flight Research Center in 1977.

Shuttle astronauts and engineers from the Johnson Space Center, and Rockwell International, Space Systems Group, Downey, Calif., will work the simulator to evaluate orbiter handling qualities with a newly developed adaptive gain device incorporated into the orbiter control system. The device was developed by Dryden center engineers and contractors after extensive flight testing in several aircraft, including the NASA fly-by-wire research aircraft.

For the Shuttle flight simulations, the pilots will sit in a replica Shuttle orbiter cockpit mounted on the moving base of the simulator. The motion drive system (electro/hydraulic) provides the pilot with the feel of the aircraft as it moves the simulator cockpit over a wide range of motions (forward and back, up and down, sideways, rolling, pitching and yawing). The range of motions available include 18 meters vertically, 12 m laterally and 2.4 m longitudinally. In addition, the cab can roll plus or minus 22 degrees from center position, pitch plus or minus 25 degrees and yaw plus or minus 29 degrees.

The cabin is equipped with a televised visual display system and a stereo audio system as well as flight instrumentation and flight controls to simulate the particular vehicle being investigated.

A computer drives the simulation system. It is programmed with the standard equations of motion relating to the motion of any object in air or space, as well as with flight characteristics and specifications of the aircraft to be simulated.

As the pilot moves the controls, electrical signals are sent to the computer which then calculates almost instantaneously the proper motion response and signals the motion drives. The computer at the same time activates the flight instrumentaton and sound system to provide the pilot with representative and realistic aircraft sounds and instrument information relating to aircraft speed, altitude, attitude position and other characteristics.

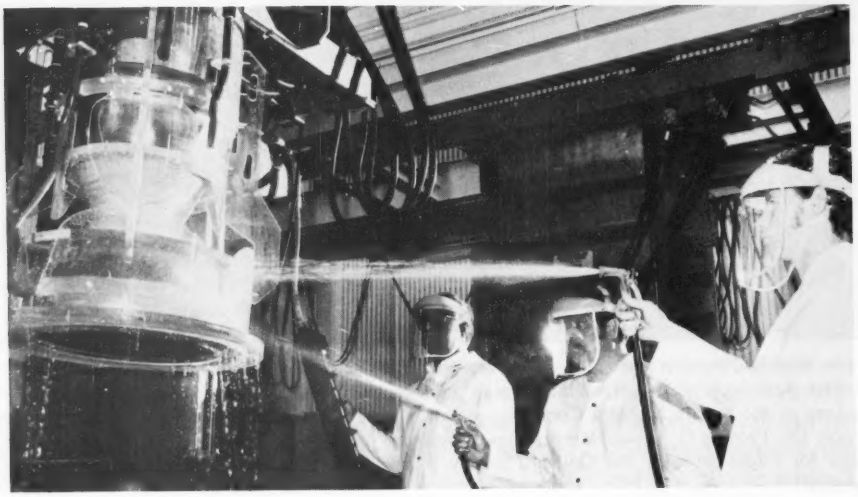
The computer also controls the visual display system. It consists of a large three dimensional terrain model (including an airport complex) and a mobile color television camera. As the simulator "flies," the computer signals the camera which moves over the model and televises the picture to the pilot through color TV sets mounted in front of the cockpit windshield. Through a special lens system, the pilot sees a picture similar to that which would appear through the windshield of a real aircraft flying over similar terrain.

Flying NASA's research aircraft simulators is as close to real flight as the state-of-the-art permits. The pilot is presented with components of the information normally used in actual flight including instrument information aircraft sounds (engine, landing gear and wheel rumble), a realistic "out the window" visual display and the "seat of the pants" feel of the aircraft.

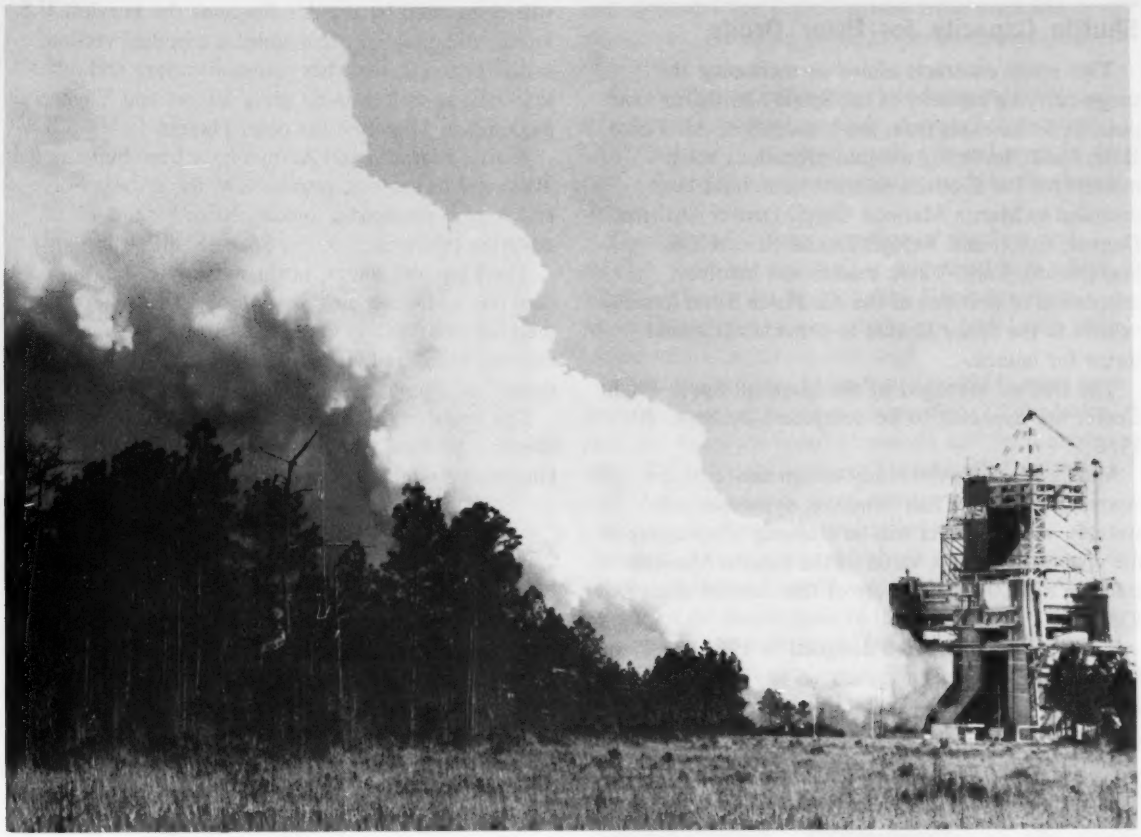
White House Presentation—In late March, President Carter presented the National Space Club's Goddard Memorial Trophy to NASA Administrator Dr. Robert A. Frosch on behalf of the Voyager mission team. Taking part in the Oval Office ceremony were, from the left, John Lent of the Martin Marietta Company, president of the Space Club; the President; Dr. Frank Press, White House science advisor; Dr. Frosch; Dr. Bruce Murray, Jet Propulsion Laboratory Director, and Robert Parks, JPL Assistant Laboratory Director for Flight Projects. The Goddard trophy is presented annually for outstanding contribution to U.S. leadership in astronautics.

Shuttle Simulator Due Upgrading—Astronaut Dave Griggs sits in the Space Shuttle One-G trainer simulating an orbiter vehicle in the JSC mockup and integration laboratory. An improved flight simulation facility is now operating at the Ames Research Center and Shuttle astronauts from Houston will be training in the new control system.

Laying Orbiter Tile—Rockwell International workers use a gauge to determine curvature of a portion of the Space Shuttle orbiter's upper wing surface before bonding more of the thermal protection system tile. The work is being performed at Kennedy Space Center, where the orbiter Columbia was brought last year before the tile placement was finished. Of the three high technology areas developed for the Shuttle, the tiles have been the most difficult to analyze.



Cleaning Shuttle Hardware—The main engine thrust chamber liner of the Space Shuttle is hosed down at the Rocketdyne Division of Rockwell International in Canoga Park, Calif. When the engine is ignited, liquid hydrogen at minus 423 degrees Fahrenheit cools the hardware inside while the combustion temperature in the throat of the chamber soars above 6,000 degrees in a chamber pressure of almost 3,000 pounds per square inch.



Pillows of steam issue from the NSTL test stand during main propulsion system firing.

Main Propulsion System Passes

Three Space Shuttle main engines, mounted in a main propulsion test article at NASA's test facility in Mississippi, were static fired for 535 seconds in the eighth test of the Shuttle's main propulsion system. The test came just three weeks after a similar test firing of 555 seconds duration.

The early morning test accomplished all objectives, according to officials at Marshall Space Flight Center which is responsible for developing and testing the complete propulsion system.

For the first time during main propulsion system testing the engines were gimballed (steered) while a "pogo effect" was deliberately induced so that engineers could observe the vehicle's reaction to this combination. Pogo is a phenomenon of cyclic propellant system pressures that has occurred under some conditions in earlier launch vehicles. The test is to demonstrate the engine accumulator system's capability to prevent pogo during flight.

Two periods of throttling two engines to 70 percent of rated power level with the third still at 100 percent verified the main propulsion system performance at differential throttling that is necessary during the early seconds of a Shuttle launch.

Another successful "first" in this test was a thrust vector control failure simulation to test whether redundant systems would perform properly in the event of such a failure during launch.

The test was planned for early morning in order to allow engineers to observe ice and frost conditions on the external tank when filled with supercold propellants during nighttime hours (in the absence of heat from the Sun).

Main propulsion testing is conducted for the Marshall Center by the Space Systems Group of Rockwell International, Downey, Calif. with support from Rockwell's Rocketdyne Division and Martin Marietta Corp., Denver, Colo. The test took place at NASA's National Space Technology Laboratories at Bay St. Louis, Miss.

Shuttle Capacity for Polar Orbits

Two study contracts aimed at increasing the cargo-carrying capacity of the Space Shuttle for near polar orbit missions from the Vandenberg Air Force Base, Calif., including a liquid propellant boost module for the Shuttle's external tank, have been awarded to Martin Marietta Corp., Denver Division, Denver, Colo., and Aerojet Liquid Rocket Co., Sacramento, Calif. These studies will involve adaptation of portions of the Air Force Titan launch vehicle to the Space Shuttle to provide additional thrust for launch.

The studies, managed by the Marshall Space Flight Center are expected to be completed by Sept. 30, 1980.

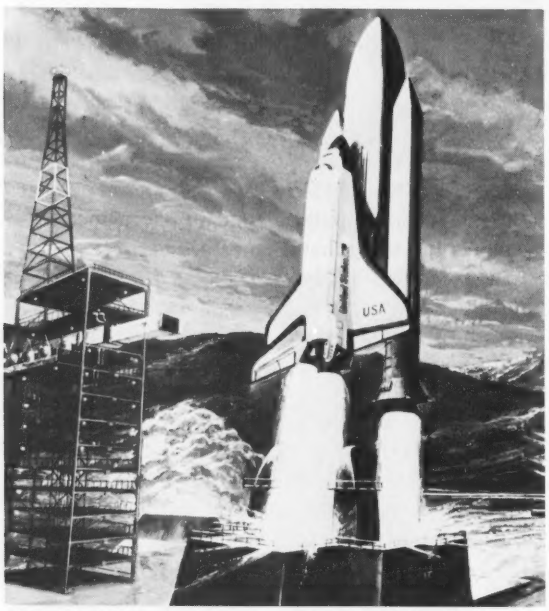
Martin Marietta will study design concepts for adaptations to the Titan structure, dynamics and systems, while Aerojet will be studying adaptations of the engines. Contract value of the Martin Marietta study is $750,000 and value of the Aerojet study is $350,000.

The Titan engines were designed in 1962 for Titan II, which was used as a launch vehicle for boosting 12 two-men Gemini spacecraft into orbit. Titan II is still being used by the Air Force as the heaviest U.S. intercontinental ballistc missile. A modified version called Titan III, launches communications and other satellites, as well as deep space Viking and Voyager payloads to Mars and the outer planets.

Martin Marietta and Aerojet have been building the Titan and its engines, respectively, for the Air Force and were considered a logical choice for the job of adapting the booster to the Space Shuttle.

The Marshall center, in the meantime, will also continue its in-house evaluation of Titan systems, methods of attaching the booster to the Shuttle's external tank, and studies to determine an optimum design for flight.

The liquid boost module is expected to increase the Shuttle's payload capability from 10,886 to 16,329 kilograms for near polar orbits.



West Coast Launch—An artist depicts the Space Shuttle orbiter, mated to its solid rocket booster and external tank, leaving a California site for near polar orbit. New study contracts awarded industry by NASA involve use of the Titan vehicle to provide additional thrust for Shuttle launches from the West Coast.

X–15's 20th Anniversary

Occupying a place of honor in the Smithsonian Institution's National Air and Space Museum in Washington, D.C., is a black, dart-like, stubby-winged craft that resembles a cross between a rocket and an airplane. The X-15 is, in fact, just that.

March 25 was the 20th anniversary of the first research flight of the X-15, the rocket plane that advanced knowledge of how man and machine function in the realm of hypersonic flight and made significant contributions to the nation's space program.

The X-15 was conceived some 25 years ago and went on to fly 199 flights in a joint NASA-Air Force-Navy research program. The craft's first research flight took place March 25, 1960; its last, Oct. 24, 1968.

During those eight and a half years it set altitude and speed records for winged aircraft that remain unchallenged. An X-15 achieved an altitude of 17,960 meters and, on another flight, a modified X-15 reached a speed of 7,274 kilometers per hour—6.7 times the speed for sound.

But altitude and speed were not the X-15's only purposes. The three X-15s served as reusable manned platforms for a range of experiments that helped advance the development of vital aeronautical and space flight systems. Materials, instrumentation, space suits and techniques were developed for NASA as well as the military. The X-15 was the latest in a series of manned rocket research planes. The first of the series—the X-1—was the first plane to fly faster than the speed of sound.

Twelve experienced military and civilian pilots flew

Setting a Record—Major Robert White, USAF, one of the prime research pilots in the X–15 program, reaches a speed of MACH 6.04, an unofficial record. The date was November 9, 1961, and the total flight time was 10 minutes.

the X-15, including Neil Armstrong, the first man to walk on the Moon, Joe H. Engle, currently an astronaut, and A. Scott Crossfield, the X-15's first pilot.

The X-15 was launched from beneath the wing of a B-52 aircraft once that aircraft had reached 13,716 m altitude and a speed of 805 km/hr.

Freed from the B-52's wing, the X-15 engine fired, rocketing the craft downrange at hypersonic speed. The flights were made over a broad expanse of desert stretching from Utah through Nevada into California. Its flight completed, the craft glided to a 322-km/hr landing on a dry lake bed at Edwards, Calif., using a conventional nose-wheel landing gear and ski-like skids at the rear.

North American Aviation, El Segundo, Calif., (now part of Rockwell International Corp. Pittsburgh) built the 15-m long X-15s after extensive wind tunnel and structural component tests demonstrated the basic validity of the design.

Virtually all of the pressures and forces measured in flight were found to be in agreement with the wind tunnel predictions. In contrast to the accurate predictions of hypersonic aerodynamic forces, however, little was known about turbulent heating rates for vehicles in this speed range. Measured flight data showed a marked departure from available predictions, averaging about 35 percent lower than expected.

The X-15 required a departure from ordinary aircraft construction materials. A nickel-steel alloy called Inconel X was used on all external areas of the craft exposed to high temperatures such as the skin of the fuselage, wing and tail.

The internal primary structure of titanium and stainless steel was designed to withstand heat which might penetrate the Inconel skin. For other areas, where neither high temperatures nor high loads were encountered, aluminum was used.

When the X-15 program began in 1954, there were many unknowns about hypersonic flight (flight faster than five times the speed of sound) and flight above most of Earth's atmosphere. The effects of weightlessness, high heat rates, steep reentry angles, the difficulty of attitude control in space, all were questions that only actual flight in the hypersonic, low space environment would answer.

One of the major goals of the X-15 program was to explore the capabilities and limitations of a human pilot in an aerospace vehicle. The X-15 showed that a human pilot can play an important role in the safe and successful completion of a mission. The basic

One of the Few—Astronaut Joe Engle, Space Shuttle backup crew commander, visited the National Air and Space Museum on the 20th anniversary of the X–15's first research flight. Engle flew the rocket powered airplane sixteen times.

philosophy of piloted aircraft operation was shown to be just as applicable to the realm of hypersonic and space flight as it is to supersonic flight.

Analysis of the first 44 flights showed that 13 of them would have failed in the absence of a human pilot together with the various redundant systems provided in the airplane. There were only a few examples where pilot error degraded the mission performance. The only fatal crash of an X-15 occurred in 1967.

The broad positive finding of the program, however, was that the capabilities of the human for sensing, judging, coping with the unexpected and employing a fantastic variety of acquired skills remains essentially undiminished in all the key problem areas of aerospace flight.

When originally designed, the X-15 was expected to generate extremely valuable information about the realm of hypersonic flight. While it did indeed provide a wealth of such information, the X-15 program's greatest contribution was to knowledge of space flight.

One significant contribution to the space program was the demonstration that simulators could be used extensively for crew training. There were no two-seat X-15s so the pilots trained in simulators. The success of this method paved the way for similar all-out use of simulators in the space program.

Government and industry teams, working together on the X-15 program to solve unprecedented problems, became an invaluable asset in the space program. Scientists attached instruments to the X-15 and loaded others aboard in modified compartments. Astronomy, Earth science, solar studies and other fields all were given a boost by the X-15. The program produced more than 700 technical documents, 200 of which reported general research that would not have been undertaken otherwise. Total cost of the X-15 program, including construction of the three aircraft, was about $300 million.

In addition to the aircraft on display at the Smithsonian, X-15 number 2 is on display at the Air Force Museum at Wright-Patterson Air Force Base, Dayton, Ohio. The third craft was destroyed in the 1967 crash.

Other X-15 pilots were: Joseph A. Walker, NASA; Robert M. White, Air Force; Forrest S. Petersen, Navy; John B. McKay, NASA; Robert A. Rushworth, Air Force; Milton O. Thompson, NASA; William J. Knight, Air Force; William H. Dana, NASA; and Michael J. Adams, Air Force, who died in the 1967 accident.

Antarctic Meteorite Searchers Busy

Researchers from NASA and the National Science Foundation have found what looks like a promising new meteorite field in the Antarctic. For the past four years meteorite hunters have been ranging over the Allen Hills area of Antarctica looking for and retrieving meteorites. The number of meteorites found has increased substantially the number available for research, especially in the area of organic chemistry.

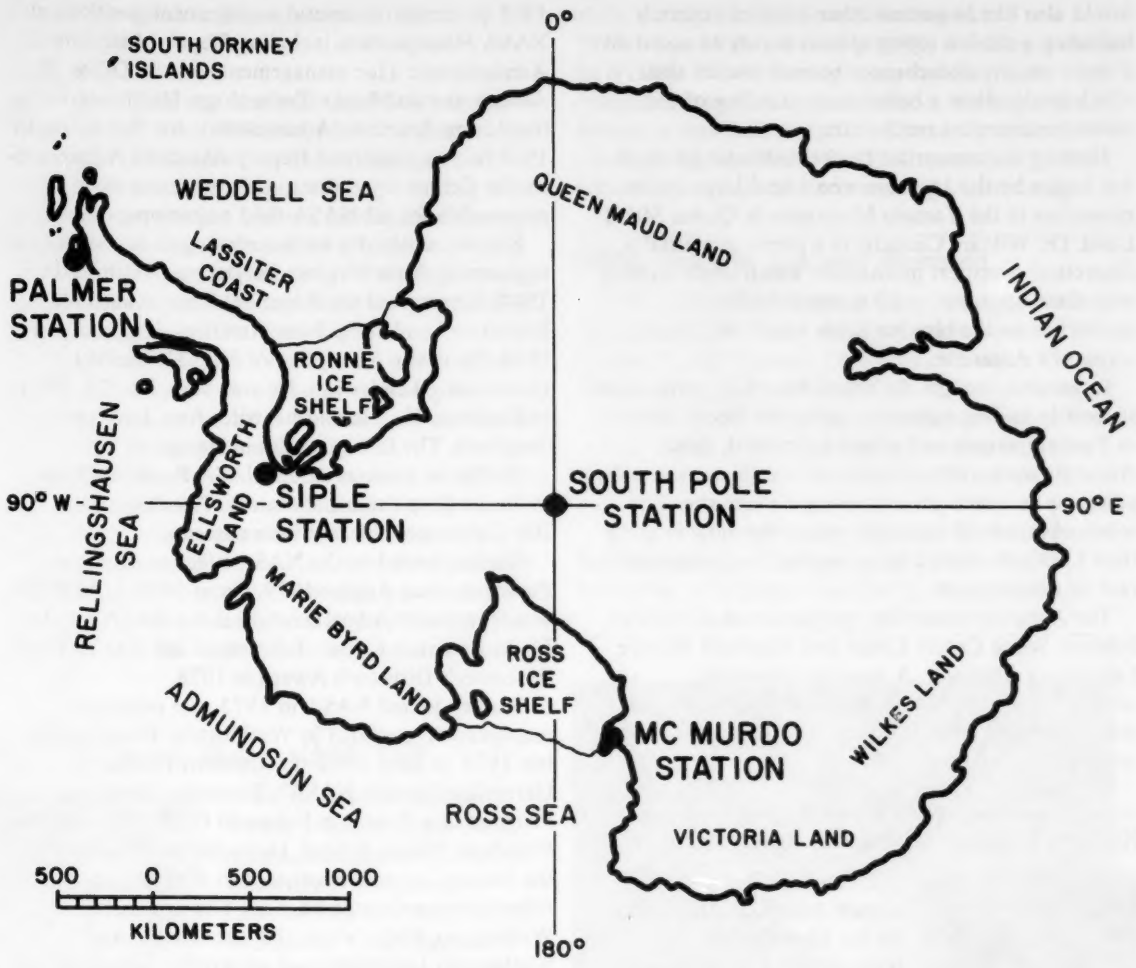
The new meteorite area, near Reckling Peak, in a previously unexplored region of the giant ice continent, is about 320 kilometers north of the U.S. station at McMurdo Sound.

The meteorite research and retrieval is carried out by university and government researchers led by Dr. William Cassady, University of Pittsburgh, and funded by the National Science Foundation. The teams have included members of the Japanese polar research team and members of a group from Johnson Space Center, Houston.

The meteorites are collected and treated in much the same manner as the lunar samples which were retrieved by the Apollo astronauts. Because of the remarkable preserving characteristics of the ice shelf, Dr. Cyril Ponnamperuma, chemical evolution researcher at the University of Maryland, College Park, has said these Antarctic meteorites are the best extraterrestrial samples yet found.

The ice, cold and dry conditions of the Antarctic serve to preserve the meteorites, many of which have been there for hundreds of thousands of years, in the

Searchers and a Find—A team from the National Science Foundation leaves a Navy helicopter to pick up a meteorite, starkly visible on the Antarctic ice. NSF and NASA meteorite hunters say they are collecting the best extraterrestrial material ever found.



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same condition as they were when they first entered Earth's atmosphere. For this reason, researchers like Ponnamperuma can examine the samples for evidence of an organic history predating their arrival on Earth.

The new meteorite area is perhaps three or four times as large as the Allen Hills area, according to associate lunar curator John Annexstad, who, along with other members of the NASA-National Science Foundation team, discovered the field in the recent Antarctic summer season. The continent of Antarctica is about as large as the United States and Mexico combined with nearly 98 percent of the surface covered by ice.

Annexstad said the new area, consisting of two different fields tentatively identified as Reckling Peak Moraine and Elephant Moraine, will take several seasons to survey. "It's just about at the limit of helicopter support. We used snowmobiles to get there from the Allen Hills area this time," he said. The new area is more promising than the Allen Hills area and more dangerous. "This area (Reckling Peak) contains many crevasses, and what we may find is that all the meteorites are lodged at the bottom of one of these," Annexstad said.

During the initial reconnaisance of the area, 27 meteorites were spotted. "And those were spotted while we were actually looking around at the site. We weren't really looking for them, they just caught our eye," Annexstad added.

The NASA-National Science Foundation team

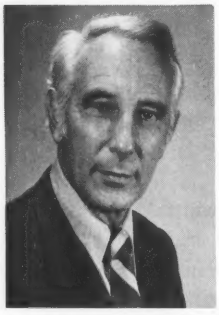
would also like to pursue other areas of research including a sub-ice topographical survey to ascertain if there are any disturbances beneath the ice shelf which might allow a better understanding of the meteorite transport mechanism.

Hunting for meteorites on the Antarctic ice shelf was begun by the Japanese who found large caches of meteorites in the Yamato Mountains in Queen Maud Land. Dr. William Cassady, in a paper, proposed a theoretical transport mechanism which might explain why there appeared to be a concentration of meteorites on the blue ice fields which are dotted across the Antarctic.

In general, though, the teams have had tremendous success in finding meteorites using the theory. And, as Ponnamperuma and others have cited, these Antarctic meteorites are the next best thing to actually going out in space and retrieving a meteorite. The total collection of Antarctic meteorites now is more than 1,600, of which a large number are considered rare or unique types.

The Antarctic meteorites are processed at NASA's Johnson Space Center Lunar and Planetary Science Laboratory, Houston. A steering committee established by the NASA-National Science Foundation team supervises distribution of the samples to researchers.

Kilgore Named Associate Administrator



Edwin C. Kilgore has been named Associate Administrator for Management Operations at NASA Headquarters. The appointment is effective immediately.

Ann P. Bradley has been named Deputy Associate Administrator for Management Operations, effective April 6.

Kilgore has been acting Associate Administrator for Management Operations since August 1979. Prior to that he had been Director for Management Operations at NASA's Langley Research Center since 1975.

Kilgore joined Langley's engineering division in 1944 as a development design engineer. In 1954 he was named technical assistant to the machine design branch. He became assistant chief of the engineering service division in 1960 and chief of the flight vehicles and systems division in 1968. From 1970 through 1975 he served in several management positions at NASA Headquarters including Deputy Associate Administrator (for management) in the Office of Aeronautics and Space Technology. He also served as the Acting Associate Administrator for that office. In 1974 he was appointed Deputy Associate Administrator for Center Operations, a management office responsible for all NASA field center operations.

Kilgore received a bachelor's degree in mechanical engineering from Virginia Polytechnic Institute in 1944. He received the Roger W. Jones Award for Executive Leadership from American University in 1978. He is also a recipient of NASA's Medal for Outstanding Leadership. He was born Jan. 24, 1923 at Coeburn, Va. He and his wife, Ann, have two daughters. The family resides in Hampton.

Bradley is manager of the NASA Resident Office at the Jet Propulsion Laboratory, Pasadena, Calif. Her replacement has not been named.

She has served as the NASA office manager at Pasadena since August 1979. From 1976 to 1979 she was Director of Administration at the NASA Dryden Flight Research Center, Edwards, Calif. She received the center's Director's Award in 1978.

Bradley joined NASA in 1973 as a personnel management specialist in Washington. From September 1974 to June 1975 she attended Princeton University through NASA's Executive Development Program as a Princeton Fellow in Public Affairs in the Woodrow Wilson School. Upon her return in 1975, she became executive assistant to then Deputy NASA Administrator George M. Low. She is a native of Washington, D.C., where she attended George Washington University and received a bachelor's degree in administration.

Duff New Director of Public Affairs

Brian M. Duff has been named Director, Public Affairs at NASA Headquarters. The appointment was effective April 7. Duff brings to NASA more than 17 years of management communications and media services experience, including 10 years of government public affairs experience. He had been Managing Director, Public Affairs at Amtrak in Washington, D.C., where he supervised the headquarters public affairs staff and three field offices. Earlier,

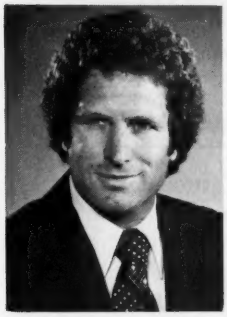
he served two years as Deputy Assistant Secretary for Public Affairs at the Department of Health, Education and Welfare.

Previously, Duff was employed by NASA at the Johnson Space Center, Houston, where he directed the full range of public affairs activities during a period of intense manned space flight activity, including five lunar flights and the first manned landing on the Moon. Duff also spent five years as NASA Headquarters Director of the Special Events Division, where he was responsible for a wide variety of public affairs activities.

In 1969 Duff was Vice President for Communications of the National Urban Coalition, where he established the department of communications for the new national public service organization.

As NASA Director, Public Affairs, Duff will be responsible for agencywide activities involving the general public, the news media and the educational community. He reports to the Associate Administrator for External Relations and serves as a principal advisor to the Administrator and Deputy Administrator. He received his degree from the University of Michigan.

Ballhaus Heads Major NASA Unit



Dr. William F. Ballhaus, former member of the Aeromechanics Laboratory, Army Research & Technology Laboratories (AVRADCOM) and former Chief, Applied Computational Aerodynamics Branch, NASA Ames Research Center, has been named Director of Astronautics at Ames, at 35 one of the youngest men ever to hold that position. The Astronautics Directorate, one of five major Directorates at Ames, is responsible for Airborne Missions and Applications Division, Project Pioneer, Space Project Division, Space Science Division and the Thermo-and Gas-Dynamics Division.

Ballhaus has been with the Aeromechanics Laboratory since 1971 when he received his Ph.D from the University of California at Berkeley. As Chief of the Computational Aerodynamics Branch, he was the first Army research scientist to head a NASA research branch.

The author of more than 30 technical papers on computational aerodynamics, he was co-recipient of the prestigious H. Julian Allen Award in 1977, a Special Act Award in 1979, including a check for $1,000 "for advancing computational fluid dynamic methods as a practical tool for improving designs of transonic aircraft . . .", and the coveted Lawrence Sperry Award for 1980, presented by the American Institute of Aeronautics & Astronautics.

NASA General Counsel Honored

S. Neil Hosenball, General Counsel for the National Aeronautics and Space Administration is one of 10 winners of the National Civil Service League Career Service Awards for 1979–80.

Hosenball, who was named to his present position in June 1975, was cited in his nomination as having been "instrumental in shaping NASA's legal and management policies from the agency's earliest years."

A native of New York City, Hosenball received a Bachelor of Science degree in 1948 from the University of Michigan and his LL.B. degree from

Newest Saturn Release—This photograph of Saturn was issued after computer enhancement brought out the rings and other features. It was taken by Voyager 1 on March 20, 1980, at a distance of 312,270,000 kilometers. One of Saturn's moons, Rhea, can be seen at lower left. Voyager 1 will make its closest approach to Saturn on November 12, 1980 while the sister craft, Voyager 2, will fly past in August, 1981. The project is directed by the Jet Propulsion Laboratory.

Harvard Law School in 1951. He is a member of the Ohio and Florida Bars and is admitted to practice before the U.S. Supreme Court.

After a time in private law practice, in 1961 he became Chief Counsel at NASA's Lewis Research Center in Cleveland. In 1966 he came to NASA Headquarters in Washington as Assistant General Counsel for Procurement Matters and the following year was named Deputy General Counsel.

Hosenball is a member of the Administrative Conference of the United States and is active in the work of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space. He is a frequent writer and lecturer on space law, administrative law, procurement law and related subjects. In 1967 he was awarded the NASA Exceptional Service Medal and the NASA Distinguished Service Medal in 1973.

He and his wife, the former Rosalyn Green, make their home in Washington, D.C. They have three children.

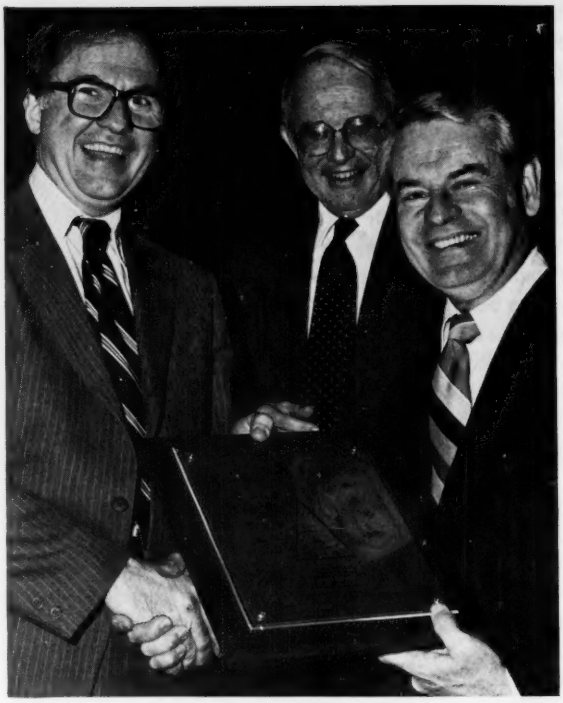
NASA Selects Gamma Ray Contractors

Two companies have been selected for negotiation of contracts to perform Phase I concept design studies for the Gamma Ray Observatory space astronomy mission. The companies are the General Electric Co., Space Division, Valley Forge, Pa., and the TRW, Inc., Space Systems Group, Redondo Beach, Calif.

The studies are to be completed in six months at a cost of about $500,000 each. It is planned that one of these contractors will be selected to build and operate the satellite under a separate, follow-on contract after the mission receives Congressional approval for development.

The observatory, weighing more than 11,000 kilograms is expected to carry five large gamma-ray instruments requiring sustained pointing at gamma ray sources in space. The spacecraft system will provide attitude control, power and command-communications systems to support the scientific instruments.

Gamma rays are one of three kinds of radiation emitted by radioactive substances, and their ability to penetrate matter is high. Their energies range from 5 to 13 electron volts. The rays are produced in many ways. One way is that cosmic rays interact with gases, dust and magnetic fields that exist between stars, producing gamma radiation. The gamma rays can therefore be used to trace and map the distribution of cosmic rays and gas in the galaxy.



Two Decades of Delta—In a ceremony at the Goddard Space Flight Center, Goddard Director A. Thomas Young (left) accepts a National Space Club Special Award from Space Club President John Lent as NASA Deputy Administrator Dr. Alan Lovelace approves. The award and others honored Goddard management of the Delta launch vehicle, after the workhorse rocket compiled its 150th successful operation since 1960.

Until the 1940's, virtually all astronomical knowledge was derived from the very narrow portion of the electro-magnetic spectrum called the "optical window," the range of frequencies to which our eyes are sensitive. After World War II, largely as a result of technical developments in the radar field, radio astronomy emerged. With the advent of orbiting satellites, the X-ray portion and then the infrared portions of the electromagnetic spectrum came under study by space vehicles. Gamma ray astronomy is providing fundamentally new information about stars, the galaxy and the universe.

The GRO is planned to be launched aboard the Space Shuttle in the mid-1980s, and to be capable of being retrieved at a later time. The GRO expected mission life is about two years.

The project will be managed by the Goddard Space Flight Center, under direction of NASA's Office of Space Science.

Materials Processing in Space Reviews

A series of comprehensive scientific reviews covering all of NASA's ground-based and flight experiment work in the field of materials processing in space (MPS) is underway at the Marshall Space Flight Center.

Marshall is sponsoring the reviews on behalf of Dr. John R. Carruthers, Director, MPS Division, Office of Space and Terrestrial Applications, NASA Headquarters. Dr. Carruthers is expected to attend all of the planned reviews. Lowell Zoller, manager of the Marshall Center's Materials Processing in Space Projects Office, said the reviews "will provide a measure of the continuity and coherence which is needed among the many university, industrial and government researchers as this scientific effort matures." The meetings will be annual events, he said, with one series in the spring and another in the fall.

Marshall center investigators participating include Dr. Mary Helen Johnston, Dr. Lou Lacy, Dr. William Oran, Dr. Mirt Davidson and Dr. Robert Snyder. Attendance of approximately 50 persons, from throughout the U.S. is anticipated for each review. Topics for the reviews cover the general field of crystal growth processes, material solidification processes, containerless processing and fluid dynamics.

Teleoperator Maneuvering System

NASA has asked the aerospace industry for proposals on a study of mission requirements and systems definition for a teleoperator maneuvering system for the Space Shuttle.

The project involves the development of a versatile remotely-controlled propulsive stage "mini-tug" vehicle for providing a wide range of payload placement, retrieval, servicing, and assembly support functions in Earth orbit.

The request for proposals was issued by the Marshall center. A task team in Marshall's Program Development Directorate will manage the studies.

Development of an earlier version, called teleoperator retrieval system had been initiated by NASA in October, 1977, as part of an effort to re-boost the falling Skylab Orbital Workshop. That Skylab-related project was later terminated, however. NASA is now looking at an updated, more capable teleoperator maneuvering system.

Multiple Threat at Wallops—A curious-looking, hydra-headed rocket was mounted and launched from Pad 2 at the Wallops Flight Center in February. Despite the unusual payload, the booster was identified as an "old reliable" Honest John, one of many used at Wallops over the years. The five-arm payload configuration is part of a new electronic time fuze for the Department of the Army's multiple launch rocket system and is being developed by the Harry Diamond Laboratories near Washington. Plans are for the new fuze to be employed by NATO forces in a field artillery system of self-reloading pods.

F–104 Flight Extends Low-G Time

A low-gravity materials processing experiment was flown recently on a NASA F-104 aircraft at Dryden Flight Research Center, and an analysis of data and photographs taken during the flight shows that up to 60 seconds of low gravity can be obtained during each parabola—twice the time of a KC-135 parabola.

"This means," said Richard Poorman of the Materials Processing in Space Project, "that we can evaluate proposed low-g experiments at a very low cost prior to flying them in much more sophisticated and expensive payloads. We can use the F-104 for this purpose without changing its configuration and without interrupting its normal work assignments."

The experiment flown was one of dendrite remelting and macro segregation with several scientific objectives. The experiment apparatus was developed at Marshall center and the principal investigator is Dr. Mary Helen Johnston.

Since the experiment is one that had already been flown on Space Processing Applications Rocket, (SPAR) data and photos from the F-104 flight could be compared with those from the previous SPAR flight to assure that the low-g level obtained in the F-104 will be a useful evaluation environment for proposed low-g experiments.

"Analysis of the experiment flown recently," said Poorman, "indicates that the F-104 test bed provides a much-needed intermediate capability, at quite moderate cost, between the limitations of laboratory and drop-tube testing and the substantially more complex and costly flight programs on SPAR and planned Space Shuttle flights."

The Robot Role

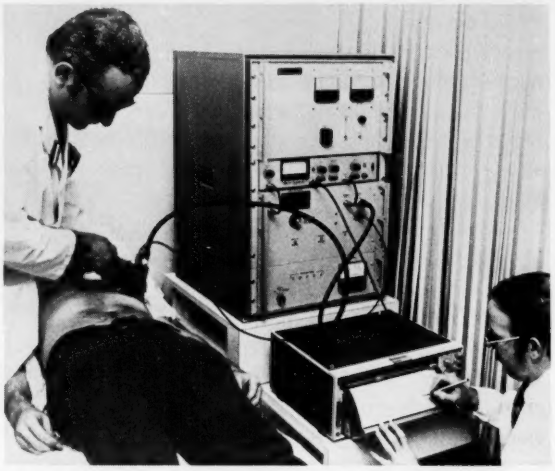
The role that robots could play in future space exploration will be the subject of a 10-week, NASA-sponsored summer study at the University of Santa Clara, June 23 through August 29, 1980.

This study will be an important contribution to establishing Office of Aeronautics and Space Technology long-term technology goals in the area of advanced automation, such as machine intelligence and robotics.

An interdisciplinary team of 20 university professors from around the country is being selected to explore the feasibility of using robots instead of humans on such candidate missions as deep space exploration, Earth-orbital-based exploration, space utilization, Earth-orbital launch and support operations, and aeronautical systems.

Academic participants are being selected through a joint NASA Office of University Affairs and American Association of Engineering Education program. Dr. Timothy Healy of the University of Santa Clara and J. E. Long of the Jet Propulsion Laboratory are codirectors of the study.

This study will follow and utilize the results of a one-week advanced automation goals symposium, chaired by Dr. Robert Cannon of Stanford University.



NASA Steps to Combat Cancer—Dr. Anas El Mahdi (left) and Dr. James Shaeffer of Norfolk General Hospital in Virginia use a microwave applicator to detect a possible tumor in a patient. Developed through research at Langley Research Center, the instrument uses aerospace technology to discover cancerous human tissue. In Houston, the Johnson Space Center is supporting St. Joseph's Hospital in its work with heat, or hyperthermia, treatment of cancer.

Contractor News

Serv-Air, Inc., of Greenville, Tex., has been selected for final negotiations of a contract for the operation, maintenance and repair of NASA Dryden Flight Research Center facilities at Edwards, Cal. A one year contract with two one-year options is under contemplation. The basic year is estimated to cost in the vicinity of one million dollars with an approximate total of $3.4 million for the three-year period.

Planning Research Corporation's Data Services Company, of McLean, Va., has been awarded a contract to provide automatic data processing services for Goddard Space Flight Center's Management Systems Office. The contractor's estimated cost of the

cost-plus-award-fee contract is $4 million plus for a base period of one year, with three additional one-year optional extensions. The office is responsible for all administrative automatic data processing functions at Goddard and the services include consultation, systems development, production computer processing and customized technical support.

ACL-FILCO Corporation, of 3333 W. Warner Avenue, Santa Ana, Cal., has won a contract with NASA to manufacture hydraulic control units for use in the Space Shuttle program. The firm fixed price contract is for a total of over $1 million. Under its provisions, ACL-FILCO will manufacture 10 hydraulic control units to be employed as ground support equipment, with three of the units installed in Bay 2 of the Orbiter Processing Facility at the Kennedy Space Center and the remaining seven used in Mobile Launch Platform Number 2. They will test the hydraulic systems of both the Space Shuttle orbiter and its two solid rocket motors before launch.

The Hampton Technical Center, a division of Kentron International, Inc., of Dallas, has received a contract modification from NASA for 10 Algol 111A Scout rocket motors. The modification is valued at approximately $2.2 million and will be effective through March 31, 1981. Scout is NASA's smallest launch vehicle, a four-stage, solid propellant rocket used to launch many kinds of payloads for DoD and several foreign countries as well as NASA. The Scout program is managed by the Langley Research Center.

Did You Know?

NASA 6 is a Beechcraft D-18, a twin engine plane used by the Computer Sciences Corp. at the Kennedy center to measure the winter freeze line in Florida. When 32-degree temperatures arrive in Florida, CSC technicians Jon Reneau and Keith Todd take off from Patrick Air Force Base on their freeze finding missions. Data from an infra-red multispectral scanning system mounted in the NASA 6 aircraft is relayed to the University of Florida, which has been making a freeze line study since 1972. The University uses the scanner information in conjunction with satellite data; the result will be a computer model of Florida winter weather expectations providing highly accurate freeze forecasts to citrus growers.

Health Clinic at the Johnson Space Center has been recognized by Idea Clearinghouse for developing a more efficient and economical technique for processing blood samples taken during physical examinations. Lab supervisor Jerry Terrell learned of the technique, using the Gifford System 5 chemistry analyzer, at a convention of medical technologies in Denver. Cholesterol, triglyceride, uric acid and SGOT levels in the blood are tested during examinations. With the new system, and Terrell's development of micro procedures (using less reagent), there has been a 79 percent decrease in the total cost of blood sample processing over previous methods.

"Planet Mars", the NASA motion picture available to all centers for viewing, has been awarded the Bronze Plaque in the Scientific Research Category at the 11th International "Nikola Tesla" Festival of Scientific and Technical Films, 1980, at Belgrade, Yugoslavia.

Two firms of the **NASA/DoE/industry wind turbine generator team,** Structural Composites, Inc., and Kaman Aerospace Corp., won Materials Engineering Magazine awards for the best use of materials and materials fabrication processes in product design and manufacture. Structural Composites received the Grand Award for developing a filament winding process to produce a composite spar for a wind turbine rotor blade and Kaman Aerospace earned an Award of Merit for its part in designing, building and testing the blade.

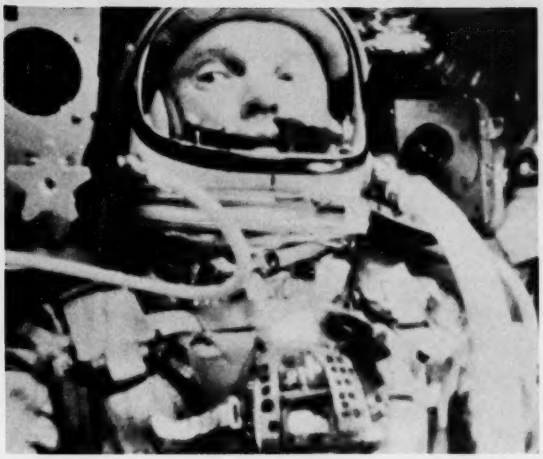
Patents for Inventions from NASA Research

The office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

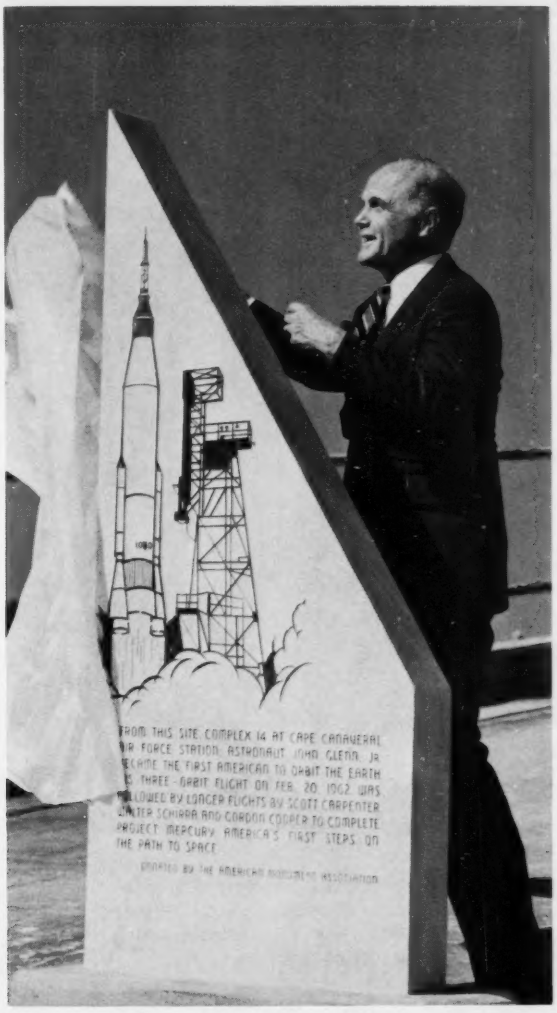
Inventor(s) & Employer	Title	Patent No.	Installation
John W. Kaufman, NASA/Marshall	Wind wheel electric power generator	4,191,505	MSFC
Ronald N. Jensen, NASA/Langley	Combined solar collector and energy storage system	4,192,290	LaRC
Jose D. Giner, Kathleen J. Cahill Giner, Inc., Waltham, Mass.	Catalyst surfaces for chromous/chromic redox couple	4,192,910	LeRC
Sidney O. Kastner, NASA/Goddard	Diffractoid grating configuration for X-ray and ultraviolet focusing	4,192,994 3–10	GSFC
Henry C. Hoffman, James H. Donohue NASA/Goddard	Active nutation controller	4,193,570	GSFC
John A. Woollam, NASA/Lewis	Atomic hydrogen storage method and apparatus	4,193,827	LeRC
Demetrius A. Kourtides John A. Parker, NASA/Ames	Low density bismaleimide carbon microballon composites	4,193,829	ARC
A. Bruce Whitehead Thomas A. Tombrello, Caltech/JPL	Method and means for helium/hydrogen ration measurement by alpha scattering	4,194,115	NRO/JPL
Earl R. Collins, Caltech/JPL	Improved system for slicing silicon wafers	4,191,159	NRO/JPL
David C. Grana Richart T. Wilem, NASA/Langley	Kine-Pak-A self-contained electrical power generator system	4,191,893	LaRC
Lien C. Yang, Caltech/JPL	Portable heatable container	4,193,388	NRO/JPL
James F. Charles Harry Theakston, Rockwell Int. Space Systems Group Downey, Calif.	Floating nut retention system	4,193,435	JSC
Joseph S. Heyman, NASA/Langley	Solid state phase insensitive ultrasonic transducer	4,195,244	
Meyer M. Lemcoe Harry E. Pattee Battelle Lab., Columbus, O.	Attaching of strain gages to substrates	4,195,279	DFRC
Rodolf A. Schindler, Caltech/JPL	Improved velocity servor for continuous scan interferometer	4,193,693	NRO/JPL

Launches for 1980

Name	Launch Date	Vehicle	Range	Mission Remarks
FLTSATCOM-C	January 17	Atlas Centaur	ETR	DOD Navy. Reimbursable
SMM-A	February 14	Delta	ETR	NASA. Scientific Solar Maximum Mission.
NOAA-B	May	Atlas-F	WTR	NOAA Weather. Reimbursable.
Navy-20	July	Scout	WTR	DOD Transit. Reimbursable.
GOES-D	August	Delta	ETR	NOAA Weather. Reimbursable.
Intelsat V-A	September	Atlas Centaur	ETR	Intelsat communications. Reimbursable.
Navy-21	October	Scout	ETR	DOD Transit. Reimbursable.
SBS-A	October	Delta	ETR	Satellite business systems. Reimbursable.
FLTSATCOM-D	November	Atlas Centaur	ETR	DOD Navy. Reimbursable.
Intelsat V-B	December	Atlas Centaur	ETR	Intelsat communications. Reimbursable.



Remembrance at Pad 14—On February 20, 1962, an onboard camera portrayed John Glenn in the midst of his three-orbit mission around the Earth in a tiny Mercury capsule. On the anniversary, 18 years later, Senator Glenn and his wife Annie were greeted by hundreds of aerospace, KSC, Air Force and community people at the dedication of the Mercury Monument at Cape Canaveral. Before unveiling the memorial at Complex 14, the first American to orbit the globe spoke with nostalgia of those pioneering days and cited the new goal of making access to space routine and economical with the Space Shuttle.


FROM THIS SITE COMPLEX 14 AT CAPE CANAVERAL
AIR FORCE STATION ASTRONAUT JOHN GLENN JR
BECAME THE FIRST AMERICAN TO ORBIT THE EARTH
HIS THREE-ORBIT FLIGHT ON FEB 20 1962 WAS
FOLLOWED BY LONGER FLIGHTS BY SCOTT CARPENTER
WALTER SCHIRRA AND GORDON COOPER TO COMPLETE
PROJECT MERCURY AMERICA'S FIRST STEPS ON
THE PATH TO SPACE

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

Window Film for Warm Days

A highly reflective insulating material developed to protect NASA spacecraft from intense solar radiation is now being used in a commercially-available window insulation product which offers significant energy savings. Called Nunsun*, it is a thinly metallized film adhesively bonded to the windows of homes, office buildings, schools, industrial plants and other facilities. The film reflects the Sun's heat and glare outward, thereby cutting down on the energy cost for cooling. Trained dealer personnel can affix the film to windows of any size in minutes, converting ordinary glass to heat-reflective mirror glass at low cost. Manufactured by National Metallizing, a division of Standard Packaging Corporation, Cranbury, New Jersey, Nunsun is also available in windowshade form.

Fully transparent and easily cleaned, Nunsun filters out 75 percent of the Sun's infrared heat rays which would otherwise penetrate the glass and heat interior space. In summer, the film substantially reduces air conditioning requirements. It affords additional energy savings in winter by blocking the escape of interior heat through glass. Available in color combinations, the film is said to protect draperies, carpets and other furnishings from Sun-fading.

* NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.

For the benefit of all . . .

NASA
National Aeronautics and Space Administration

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